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Indian Standard

GUIDE FOR PHYSICAL PLANNING OF COMPUTER COMPLEXES

PART 4 SERVICES

UDC 681·324

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 2

February 1987

Indian Standard

GUIDE FOR PHYSICAL PLANNING OF COMPUTER COMPLEXES

PART 4 SERVICES

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Indian Standard

GUIDE FOR PHYSICAL PLANNING OF COMPUTER COMPLEXES

PART 4 SERVICES

0. FOREWORD

0.1 This Indian Standard (Part 4) was adopted by the Indian Standards Institution on 23 January 1986, after the draft finalized by the Computers' Business Machines and Calculators Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 The information contained in this standard is intended primarily for personnel responsible for physical planning of computer complexes. Careful advance planning and preparation before actual installation of the equipment would facilitate smooth day-to-day operations. In addition, such planning would enable expansions to the complex without disruption of current operations. The entire subject of physical planning, however, is complex since it encompasses a number of specialized activities, each of which demands a separate in-depth discussion. This standard would provide some guidelines which are common to all types of computer complexes.

0.3 Two most important requirements for any computer complex are power supply and controlled environment — power supply for the very operation of the system and controlled environment for ensuring optimum performance of the equipment and providing comfort to the computer personnel. The sensitive nature of computer hardware requires a stable power supply and controlled temperature and humidity. On the other hand, proper illumination and acceptable noise levels are required to be maintained for the personnel working in the complex. Airconditioning of a computer complex (more than in any other building) is a specialized subject in its own merit. In order to avoid elaborate description of airconditioning, at the same time constrained by a need to provide a meaningful interaction between the planner and the a/c engineer salient features only are being attempted in this standard.

1. SCOPE

1.1 This standard (Part 4) provides guidance for planning, in a computer complex, essential services such as power supply, airconditioning, illumination and acoustics.

2. TERMINOLOGY

2.1 For the purpose of this standard, the terms and definitions as given in IS : 1885 (Part 52)* series shall apply.

3. POWER SUPPLY

3.1 Proper power supply is a must for any computer complex and depending on the type of installation, uninterrupted supply of power may also be required. The available supply of power should be adequate to cater to not only the computer system to be installed but also for future expansion. Normally three times the present requirement of load would serve the purpose.

The power may be drawn from more than one feeder, preferably from different sub-stations to overcome temporary failure at any one time. The power supply to any system should not be shared with any high frequency equipment or with any equipment capable of drawing a variable load such as motors, air conditioning system and lifts. Such a precaution is necessary because equipments such as motors, cause voltage and frequency fluctuations. In case stable transient-free power supply is not available, a motor alternative system or voltage and frequency regulating mechanism should be used. The various parameters to be considered in planning the power supply requirement for a system are given in Appendix A.

3.2 The planner of a computer complex often has to project the overall power requirement of the complex much before the actual make of the computer system to be installed is made known to him. In some instances, however, he may not be aware of even the configuration at the time of planning the power load. Then he would be forced to estimate the load mainly based on the likely type of system, size of the complex and services required such as airconditioning, lighting, lifts, etc. The exact details given in Appendix A can be looked into only after the final selection of the system has been made as most of the parameters would depend on the type of system installed.

3.3 The electrical installation should be designed for 3 phase — 4 wire or single phase with neutral and ground wire depending on the available power supply in accordance of IS : 732-1963†. The distribution should be so arranged that the load gets evenly distributed to all the three phases of power supply. The cable layout should be designed in such a way that the power supply cables are kept to the periphery of computer room and connected to the equipment through the shortest route. The connections should be made through junction boxes if in the vicinity of CPU or magnetic devices. All joints should be made water proof and wherever cables are required to be taken in or out of the room, it should not be done at floor level but at higher level as otherwise it may allow water ingress. All the cables should be run through conduits and in the computer room the conduits may be fixed to the under side of false floor. The power supply cables must be kept away from logic signal cables and, if unavoidable, laid perpendicular to each other to reduce interference.

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*Electrotechnical vocabulary: Part 52 Data processing.

†Code of practice for electrical wiring installation (system voltage not exceeding 650 V).

3.4 The stabilized power supply should be used exclusively for the computer equipment. For illumination and other purposes, power supply should be drawn from other sources. Similarly, for use of maintenance or test equipment, a number of service outlets should be provided with power supply connection from other sources. Such an approach would ensure that the demand on stabilized power supply would be minimized.

3.5 Good earthing is essential for ensuring the safety of both the system and the human beings working in the complex. Earthing should be provided by distributed earth in the mains cable armouring or by running on earth wire in conduit along with phase and neutral wire. The earth wire and neutral wire should be connected together at the primary transformer bank. The earth should be wired to the frames of the computer equipment also for ensuring safety of personnel. This will also facilitate proper functioning of ac line filter. Details of earthing are given in IS : 3043-1966*.

4. AIR CONDITIONING

4.1 Computer equipment are generally designed to perform within certain limits of environmental conditions. Any drastic change in temperature or humidity can cause permanent damage to the electronic circuitry. Therefore, it becomes necessary to control the environment in the computer room. Although for comfort of personnel a wider range of temperature and humidity limits may be maintained in the whole complex, additional precautions are required within the computer room since the computer equipment itself acts as large source of heat. The problem is further complicated by the possibility of moisture condensation because of high humidity and low temperature. Such condensation also can permanently damage the sensitivity circuitry. Another aspect to be controlled is the purity of air since presence of corrosive, conductive or abrasive elements in air may also cause damage.

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*Code of practice for earthing.

4.2 In view of the above problems, following factors should be considered while planning the airconditioning system:

a) Heat generated by computer system,
b) Presence of humidity sources,
c) Volume, temperature and humidity of air to be drawn into the complex,
d) Heat loss and gain through building,
e) Heat dissipated by possible number of people likely to be in the complex, and
f) External temperature and the temperature required to be maintained within the complex.

4.3 The computer complex should be equipped with an independent airconditioning plant. In case a common airconditioning facility is in use for the entire building, the impurities from other parts of the building (possibly also housing a small industry, hospital, etc) may enter the computer complex and cause harm to equipment and personnel. Within the computer room, layout should be such that heat dissipating epuipment are placed near the exhaust of the room so that dissipated heat is taken out straightway without passing through other parts of the room. In case of big systems, separate airconditioned enclosures should be provided for printers, card readers, paper tape reader/punch, etc. As the cards are likely to be most affected by humidity, arrangements should be made to provide a conditioning area outside the computer room to stabilize their dimensions before use.

4.4 When a computer complex is not working round the clock, airconditioning is invariably switched off. This may cause condensation of residual humidity on the hardware equipment which may damage many sensitive components. Therefore, arrangements should be made to blow warm and dry air within the computer equipment when the airconditioning is stopped so that humidity is reduced below condensation limits within the computer equipment.

4.5 There should be proper monitoring arrangements for temperature and humidity with facilities to sound alarms and cut off power supply in case of deviations beyond preset limits. In case of fire also the power supply to airconditioning system should get automatically cut-off as otherwise it may fan fire through ducts.

4.6 To reduce ingress of dust into the computer room, extra air pressure should be maintained inside the room compared to the outside. Further the flow of air should be from the ceiling to the floor to avoid flying of dust. Overhead ducts diffusing air from ceiling and exhausts at floor level may be used. Typical airconditioning system requirements are highlighted in Appendix B.

5. ILLUMINATION

5.1 Proper illumination is essential in a computer complex. Uniform illumination without glare is required for strain-free functioning of personnel. The VDU screens particularly require special attention as any glare or reflection on the screen may cause difficulties in reading the display. Diffused lighting with flourescent sources would prove to be ideal if uniform illumination can be provided in working area at the height of one metre. An illumination level of 600 lux is generally found adequate. More details are available in IS : 3646* series.

5.2 The illumination should be provided from a power supply other than that used for computer equipment. Direct sunlight should not be allowed to fall on any equipment to avoid decay or damage to equipment due to ultraviolet radiation of the sun. Provision should be made for emergency lighting in kay/areas.

6. ACOUSTICS

6.1 Computer complexes require acoustic treatment because computer equipment and ancilliary equipment (airconditioning system) can increase noise beyond comfortable levels. The computer equipment noise is generally from ventillation and mechanical operations such as punch, printer, etc. This cannot be reduced but can be contained and absorbed by walls and floor.

6.2 The floors, walls and ceilings may be treated with sound absorbing materials. Large glass surfaces tend to reflect noise and increase the levels inside. Therefore, it would be appropriate to isolate the noise generating equipment and house them in more sound absorbing room.

6.3 The noise from external sources and the airconditioning system can also be contained by proper insulation of airconditioning ducts and use of double doors. Other applicable recommendations of IS : 3483-1965† and IS : 1950-1962‡ may also be followed.

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*Code of practice for interior illumination.

†Code of practice for noise reduction in industrial buildings.

‡Code of practice for sound insulation of non-industrial buildings.

APPENDIX A

(*Clauses* 3.1 *and* 3.2)

VARIOUS PARAMETERS TO BE CONSIDERED IN PLANNING OF POWER SUPPLY REQUIREMENTS

a) Input voltage and tolerance permitted
b) Input frequency and tolerance permitted
c) Voltage regulation required
d) Frequency stability required
e) Power factor
f) Harmonic contents permitted
g) Voltage and phase unbalance permitted
h) Protections required:
    i) Current limiting
    ii) Short circuit
    iii) Instantaneous and sustained overload
    iv) Under and over voltage
    v) Poor earth warning
    vi) Frequency swing

APPENDIX B

(*Clause* 4.6)

TYPICAL AIRCONDITIONING REQUIREMENTS

a) Temperature	21 ± 2°C
b) Temperature change	± 2°C per hour
c) Maximum deviation within computer room	± 0·5°C
d) Humidity	50 percent ± 5 percent R 4 (non-condensing)
e) Humidity change	2 percent perhour
f) Air cleanliness	$<$ 1 micron particles $<$ 700 ppm >1 to $\leqslant 5$ micron particles $<$ 70 ppm >5 micron particles $<$ 7 ppm Total dust $< 460 \times 10^{-6}$ gm/m^3 Two or three stage fan filters may be used to obtain above desired levels.